

UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

NATURAL RESOURCES  
CONSERVATION  
SERVICE

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RESEARCH PROPOSAL

Project Title: Strip Tillage, Stubble Burning Alternative

Submitted to: Agriculture Burning Practices and Research Task Force

Funding: First Year Funding - \$4,310.00  
Second Year Funding - \$800.00  
Third Year Funding - \$800.00  
Fourth Year Funding- \$200.00  
Total- \$6,110.00

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Major Participants: Pine Creek Conservation District

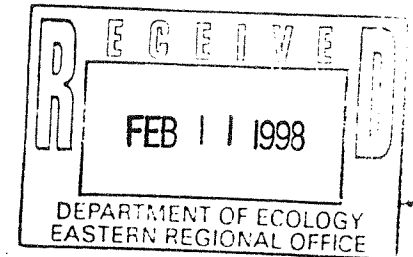
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Cooperators: Whitman County Extension

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### **Proposal Summary: Strip Tillage, Stubble Burning Alternative**

Whitman county constantly has wheat yields exceeding 75 bushels per acre. Many producers feel they have to burn in order to deal with winter wheat residue that could exceed 8000 pounds per acre.

I believe we can present a practical alternative to burning. A alternative system is currently used in Australia and could be adapted to the Pacific Northwest. A three year rotation utilizing strip tillage to deal with large residue quantities. Allen Postlethwaite, from Victoria, Australia, is now successfully growing cereals on 28 inch row spacing. Allen has noted that soil between the rows was not disturbed and there was little weed germination. The between row residue also helps to conserve soil moisture.

James Cook, research plant pathologist, has outline steps to follow when directly seeding in a cereal based rotation. Doctor Cook tells us we should not grow winter wheat more than once out of 3 years. He then offers steps to follow when seeding into cereal stubbles: 1) Residue management begins at harvest. One must have a combine equipped with a chaff and straw spreader. 2) One must eliminate grassy weeds three weeks prior to seeding. 3) One should only plant seed that is less than three years old. 4) One should plant treated seed. 5) One should use an opener that disturbs a band of soil and clears stubble from the seed row. The opener should also be capable of placing starter fertilizer with the seed and be able to band fertilizer below the seed.

The project will consist of 30 foot by 500 foot plots. The three plots will be replicated 2 times at each location. The field sites will be chosen in 18 inch and 22 inch rainfall zones. Field sites will be chosen with uniformity of soil texture, soil depth, and topography. Fertilizer samples will be taken and sent to a lab for analysis. Fertilizer recommendations will be based on University guidelines. The project will be conducted over a three year rotation cycle. The rotation would be winter wheat, barley or spring wheat, and legume or mustard or conola.

In theses experimental plots, drill row spacing will be determined by residue amounts. Residue above 5000 pounds per acre will dictate a 20 inch row spacing. ON-FARM TESTING-A GROWERS GUIDE will be given to each producer. The guide includes a field log, income summary, rainfall record sheet, cost summary, and management summary. This will insure consistency throughout the study.

- Cooperative Extension will determine yields from the experimental plots. Plot yields will be compared with average yields from burned and conventionally tilled fields.

The plot information will be published in Pacific Northwest On-Farm Test Results. The information would also be discussed at grower meetings and presented during the Pine Creek District annual meeting.

**Background:** Winter wheat is a major cash crop in Whitman county Washington. Historically Producers have maximized winter wheat acreage. Producers have found a inexpensive method to grow continuous wheat. Growers can burn the stubble, fertilize, cultivate, and seed winter wheat. Air quality, USDA conservation compliance, and increased weed and disease pressure can be a problem.

Jim Cook reports that crop rotation which include spring and winter cereals along with spring and winter legumes offer options to control grassy weeds and soil born pathogens of winter wheat.

**Related And current Work:** The Palouse Rock Lake Conservation District is utilizing the DOE alternative to Agriculture Burning grant. Corn is directly seeded into standing winter wheat stubble. The Pine Creek Conservation District does not believe the Northeast portion of Whitman county has a long enough growing season to raise corn

**Objectives:** The study will document:

- 1) Crops can be directly seeded into winter wheat standing stubble without burning.
- 2) A three year rotation will decrease weed and disease pressure on crops.
- 3) The yields and net income from the directly seeded crops will be equal or exceed continuous winter wheat systems.
- 4) The Pine Creek District will supply information about the projects through Conservation District newsletters, and watershed informational meetings.

**Approach:** Three growers in the Pine Creek Conservation District have been identified, with on alternate. The sites selected will be similar soil texture, soil depth, and topography. Each producer will conduct two test. The test will consist of three 30 feet by 50 feet plots. Each plot will contain one of the selected three year rotational crops. The crops will be winter wheat, winter peas or lentils, spring wheat, spring barley, spring peas, spring lentils, or conola. The Pine Creek District and NRCS technicians, along with guidance from Dave Huggins, will select the sites and flag the plots. The technicians and producers will select the crop rotation. The technicians will be on site when the plots are seeded. The On-Farm Research Logs will be completed. Rainfall records will be kept along with a management summary. A On Farm Research cost summary will also be completed. Yield measurements will be gathered by NRCS and Cooperative Extension. A economic analysis will be completed by the Pine Creek Conservation District Manager with help from the Cooperative Extension Office.

**Schedule:** Year 1-Cereal grains will be harvested. The combines will be equipped with chaff and straw spreaders. Plots will be selected and flagged. Field History, planting conditions, weather and field operation will be recorded. Soil test will be taken. The rotations will begin in fields of standing cereal grain stubble. Winter peas or lentils could be directly seeded into the stubble. The operators will also have the option of leaving the winter wheat stubble standing over the winter and directly seeding a spring crop.

Year 2-3 The rotation continues through the plots with all, crops directly seeded into standing stubble. Technicians will continue to gather field and yield data.

Year 3- The study results will be compiled. A economic analysis completed.

Year 4- On Farm Test results published and informational meetings conducted.

#### Budget

Year 1- straw and chaff spreaders are made available to producers. The price would be \$6,000 @ 50% cost sharing rate = \$3,000

Pine Creek Conservation District labor would be approximately 100 hours = \$1,000

Six soil test at \$35.00 = \$210.00

Drill Rental=\$100

Year 2-3 Soil Test = \$400.00

Pine Creek Conservation District labor = \$1,000

Drill Rental=\$200

Year 4- Information meetings @ 50.00 = \$ 200.00

**Current Support:** On February 9, 1997, the Pine Creek Conservation District Board of Supervisors unanimously endorsed the On-Farm Testing Projects. The Natural Resources Conservation Service supports research that will improve soil, water, and air quality.

#### References

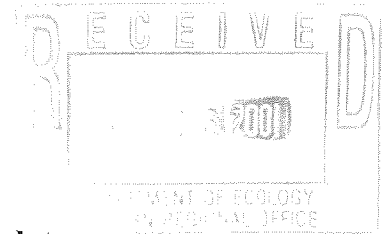
1995 Pacific Northwest On-Farm Test Results. Washington State University Department of crop and soil sciences technical report 96-1.

1998 Northwest Direct Seeding Intensive Cropping Conference Proceedings.

ON-FARM TESTING A GROWERS GUIDE. Washington State University; Miller, Adams, Peterson, Karow.

Pacific Northwest STEEP 111 Extension Conservation Tillage Update, May 1997.

5/20/01



**ON-FARM RESEARCH STRIP TILLAGE (Agreement C0000038) Update**

**Participants- Ron Kile, Mike Siler, Randy Kile (Pine Creek Conservation District)**

April 1, 1999- Control weeds "green bridge" with glyphosate (Round-Up).

May 10, 1999-Seed Afla or stand up peas into barley stubble (soil temperature about 55 degrees).

May-June, 1999- Pesticides applied.

August 10, 1999 - Ron Kile harvested pea crop, yield averaged 1800 pounds per acre.

August 20, 1999 – Mike Siler harvested winter wheat plots, direct seed plot yield was 65 bushels, mulch till plot yield was 56 bushels per acre.

August 25, 1999- Randy Kile harvested winter wheat plots, direct seed plot yield was 50 bushels, mulch till plot yield was 65 bushels per acre.

March 17, 1999- Research plot update given to Burn Task Force committee in Pasco, Washington.

April 1, 2000- Plots sprayed with glyphosate (Round-Up)

April 28, 2000-Pea plots seeded at 188.5 pounds per acre. 3.1 acres were direct and conventionally seeded using 584 pounds of Afla pea seed.

May – June, 2000-Pea plots were not sprayed for aphid. The plots are small and we could not hire anyone to apply chemicals by air. As a result, yield was lower than the expected Afla pea yield. The mulch till Afla pea yields in the area was about 2200 pounds.

July, 2000 Ron and Mike adjusted the arms on the chaff spreaders to allow more even chaff distribution.

August 19,2000-Pea plots harvested.

Ron Kile Afla pea yield was 1743 pounds per acre from the direct seeded plot and 1800 pounds per acre from the minimum till plot. Mike Siler pea yield was 560 pounds from the direct seeded plot and 720 pounds per acre from the minimum till plot. Randy Kile Afla pea yield was 450 pounds per acre from the minimum till plot and 525 pounds per acre from the direct seeded plot. Mold was found in Randy and Mike's pea plots. This may account for the lower yields.



May 2001- Plots sprayed with glyphosate.

May 31, 2001- Plots were checked and spring wheat and corn were emerging.

May 10 – 11 2001- Ron Kile seeded his plot to corn. Randy Kile and Muke Siler seeded their plots to spring wheat.

Burn Task Force Grant Strip Tillage update printed in the Pine Creek and Whitman Conservation Districts newsletter.

Informational Plot tours were given. The tours included Dennis Roe, NRCS agronomist, and Pine Creek producers. We discussed rotation, accomplishments, and future plans. We discussed the direct benefits of a legume in the rotation. In a continuous wheat rotation, grassy weeds will become a problem. Assure II can be used to control grassy weeds such as wild oats, downy brome, and goat grass. The Afilia pea or upright pea can be harvested 6 inches above the ground. This leaves more pea residue standing, which makes direct seeding an easier task. There will be not as much residue on the ground to plug equipment. A quite a few producers were reluctant to include peas in their rotations because commodity pea prices are so low.

Ron Kile and I presented our plot information to growers that were attending a direct seeding tour to the Dakotas. We told them that we have successfully direct seeded 2 crops in our rotation. We admitted that we were not dealing with enormous amounts of wheat residue. However, our yields equaled average yields from the 17 inch annual rainfall area. We discussed the rotation used in the plots. John Aeschliman, a Whitman county producer, suggested we included corn in our rotation. Our current crop is Afilia pea and corn would be the next logical crop in the rotation. We had learned that pea residue will allow the ground to warm up quickly in the spring, which is desirable for corn. We learned from Dennis Roe and John that there was a local market for corn. A feed lot will buy all the corn Whitman County growers will produce. We have decided that the next rotational crop, in Ron's plots, will be corn.

The experience that has been gained from the plots has shown that residue can be dealt with without burning. On one of Ron Kile's fields, the average winter wheat yield was 93 bushels. As was reported, Ron Kile has his combine equipped with a chaff spreader. This spreader will distribute chaff about the width of the header, which is 30 feet. This even distribution, of chaff and straw, will allow Ron to seed 85 % of the field without any additional tillage. On 15 % of the field area, Ron will disk. This is a giant step forward from burning. I am confident Ron can carry out this plan without yield reductions. This particular field is along a paved road and many people will be able to observe that he will not burn and that he will direct seeding a majority of the field.

Ron would like to invite Department of Ecology staff out to his farm. The no-till practices used on the plots have been adapted to Ron's farm.



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### **Information gained from plot work is as follows:**

Weed control is very important. Growers must control the volunteer grain, broad leaf weeds, and other grassy weeds, in their fields, 2 weeks prior to seeding. Fall application of glyphosate is necessary. For added weed control in spring seeded crops, a fall and spring glyphosate application is imperative. Pest scouting should become a part of a management system. As growers select pesticides, they must always keep the next crop in mind. Growers must not select a chemical with plant back restrictions.

Crop rotation is imperative. Planting crops other than wheat will help control disease, help control grassy weeds, and help with residue management.

Peas could be included in a cropping system with cereal grains. Growers can select a chemical that would controls grassy weeds in peas. If peas residue was left undisturbed over winter, this residue allows the ground to warm up earlier. Ron Kile found that corn seed germinated quicker when planted in peas residue as compared with cereal grain residue.

Residue management begins at harvest. Ron Kile and Mike Siler report their chaff spreaders are doing the job. They believe chaff spreaders are one of the first steps when developing a direct seeding system. The chaff is spread from 25 to 30 feet behind the combine.

Stubble that is left standing through winter allows greater water infiltration. The intact stalks and roots open soil pores and allow water to flow into the soil and not off the field. In some plots, heavy residue was disked. It was found that fall disking destroys soil structure and dries the soil out.

In reality, heavy wheat stubble is still a concern. No-till drills will still plug, with straw, while seeding. One possible solution will be chop or shred the straw in draws and other areas with heavy straw. Another solution might be to add a large seeded crop in the rotation. Ron rented a corn planter, this spring, and seeded corn into heavy residue. He also successfully planted a round seeded corn with the Concord drill, on his plots.

In the spring of 2001, we looked for worms and looked at soil structure. Large worms were found under the straw. This worm burrows straight down into the soil and open holes from the surface deep into the soil profile. This helps with water infiltration and soil mixing. In the direct seeded plots, soil structure has improved in comparison with soil structure in plots under conventional tillage. It will probably take several years before the soil structure found in the direct seeded plots will be compare to the soil structure found in undisturbed areas.

A tour group met at Ron Kile's farm and looked over his plots. They were interested in the direct seeded corn plot he had planted this spring. The group also noted the high residue amounts Ron had on all fields. In most areas on the farm, Ron only harrowed the



residue. The retained barley residue was estimated at 900 pounds per acre and the wheat residue remaining was estimated at 1866 pounds per acre after seeding. The group also noted how weed free Ron's fields are. Ron believes in a comprehensive pest control program.

A comparison was made between Ron Kile's direct seeded barley crop and the neighbor's conventional seeded barley. The two fields were planted about the same time. Barley plant samples were obtained from about the same aspect in each field. The samples revealed a dramatic difference in root structure. The direct seeded crop had significantly more root development, by June 1, 2001, than the cultivated spring barley crop (refer to photocopies).

Direct seed systems have the potential to increase crop productivity while decreasing erosion and improving air and water quality.

The plot work has revealed that direct seeding is a complicated process. A grower can learn the concepts of a direct seeding system and then apply the practices to their farm. I believe this will be a slower process than I had first anticipated. At this time, I believe grower education is the key component that will allow more Palouse farmers to adopt the direct seeding concepts.

#### **On Farm Research Strip Tillage (Agreement C00000 38)**

#### **Anticipated July 30, 2000 to June 30, 2001 Budget**

<b>Item</b>	<b>Units</b>	<b>Unit cost</b>	<b>subtotal</b>
SW/corn seed	6	\$17.50	\$105.00
Fertilizer	6	\$72.00	\$432.00
Pest control	3	\$48.33	\$145.00
Equipment rental	6	\$60.00	\$360.00
Round-UP	3	\$20.00	\$60.00
Tour refreshments	1	\$25.00	\$25.00
Salary			\$445.00



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**Anticipated Work Plan July 30, 2000 to June 30, 2001:**

November 1, 2000: spray plots with glyphosate  
February-March 2000: make modifications to two chaff spreaders  
March 10, 2001: spray plots with glyphosate  
April 12, 2001 spray plots with glyphosate  
April 15, 2001: direct seed spring wheat or corn  
April-June 16, 2001: apply pesticides  
July, 2001 Tillage update printed in District newsletter  
August 15, 2001: harvest spring wheat  
October 8, 2001: harvest corn

Turned-in by Ed Teel

